WHAT IS CLAIMED IS:

1. A method for removing excess fluid from a patient comprising the steps of:

   a. removing blood directly from a first peripheral blood vessel in the patient;

   b. filtering the removed blood through a filter to separate the excess fluid from the blood;

   c. returning the filtered blood into a second peripheral blood vessel in the patient;

   d. wherein a blood flow through the filter is less than two percent of a total cardiac output of the patient, and a flow of the excess fluid removed from the blood is in a range of 0.1 to 1.0 liters per hour.

2. A method as in claim 1 wherein the excess fluid removed from the blood is in a range of 15 to 30 percent of a volume of the removed blood.

3. A method as in claim 1 wherein the step of filtering is performed by sieving the blood through a filter to remove excess fluid.

4. A method as in claim 1 further comprising the step of pumping the removed blood with a blood pump at a rate of less than 100 milliliters (ml) per minute.

5. A method as in claim 1 wherein a rate of the removal of blood is no greater than 60 milliliters per minute and a rate of removal of the excess fluid is no greater than 16 milliliters per minute.

6. A method as in claim 1 wherein a rate of the removal of blood is in a range of 40 to 60 milliliters per minute, and a rate of removal of the excess fluid is in a range of 1.6 to 16 milliliters per minute.

7. A method as in claim 1 further comprising the step of removing solute from the blood by a kidney in the patient, where the kidney is at least partially functional.

8. A method as in claim 4 wherein the blood pump stops upon detection of a blockage of blood flow in the blood being removed in step (a).

9. A method as in claim 1 wherein the blood pump stops upon detection of a air bubble in the blood during any of steps (a), (b) and (c).

10. A method as in claim 1 wherein the first peripheral blood vessel is a vein.

11. A method as in claim 1 wherein the second peripheral blood vessel is a vein.

12. A method as in claim 1 wherein the first and second peripheral blood vessel are the same vein.

13. A method as in claim 1 wherein the filter includes capillary, hollow fibers.

14. A method as in claim 13 wherein the hollow fibers have filtering pores which retain in the blood solutes greater than 50,000 Daltons.

15. A method as in claim 13 wherein the hollow fibers have blood passages of approximately 0.2 mm or less in diameter.

16. A method as in claim 1 wherein the filter has a trans-membrane pressure (TMP) in a range of 150 millimeters (mm) of mercury (Hg) to 250 mmHg.

17. A method as in claim 1 wherein the blood flow through the filter causes a wall shear rate of the blood between 1,000 sec^{-1} per seconds and 2,500 per seconds.

18. A method as in claim 1 wherein the filtration is ultrafiltration.

19. A method as in claim 1 further comprising minimizing extraction of solutes during filtration.

20. A method as in claim 1 further comprising extracting primarily water as the fluid removed from the blood during filtration.

21. A method as in claim 1 wherein blood flows continuously through the filter during periods in which a blood pump is pumping the removed blood.

22. A method as in claim 1 wherein excess fluid removed from blood flows intermittently from the filter.

23. A method as in claim 22 wherein a valve in a flow path from the filter for removal of excess fluid cyclically stops and starts the flow of excess fluid from the filter.

24. A method as in claim 1 wherein a total amount of extracorporeal blood is not greater than 100 milliliters.

25. A method as in claim 1 wherein said fiber includes less than 1000 filtering fibers.

26. A method as in claim 1 wherein blood removed during step (a) is returned in step (b) within two minutes.

27. A method for removing excess water from a patient comprising the steps of:

a. removing blood directly from a first peripheral blood vessel in the patient;

b. condensing the removed blood through a filter to separate the excess water from the blood;

c. returning the condensed blood into a second peripheral blood vessel in the patient;

d. wherein a blood flow through the filter is less than two percent of a total cardiac output of the patient, and a flow of the excess fluid removed from the blood is in a range of 0.1 to 1.0 liters per hour.

28. A method as in claim 27 wherein the excess water removed from the blood is in a range of 15 to 30 percent of a volume of the removed blood.

29. A method as in claim 27 wherein the step of filtering is performed by sieving the blood through a filter to remove excess water.

30. A method as in claim 27 further comprising the step of pumping the removed blood with a blood pump at a rate of less than 100 milliliters (ml) per minute.

31. A method as in claim 27 wherein a rate of the removal of blood is no greater than 60 milliliters per minute, and a rate of removal of the excess water is no greater than 16 milliliters per minute.

32. A method as in claim 27 wherein a rate of the removal of blood is in a range of 40 to 60 milliliters per minute, and a rate of removal of the excess water is in a range of 1.6 to 16 milliliters per minute.

33. A method as in claim 27 further comprising the step of removing solute from the blood by a kidney in the patient, where the kidney is at least partially functional.

34. A method as in claim 30 wherein the blood pump stops upon detection of a blockage of blood flow in the blood being removed in step (a).

35. A method as in claim 30 wherein the blood pump stops upon detection of a air bubble in the blood during any of steps (a), (b) and (c).

36. A method as in claim 27 wherein the first peripheral blood vessel is a vein.

37. A method as in claim 27 wherein the second peripheral blood vessel is a vein.

38. A method as in claim 27 wherein the first and second peripheral blood vessel are the same vein.

39. A method as in claim 27 wherein the filter includes capillary, hollow fibers.

40. A method as in claim 39 wherein the hollow fibers have filtering pores which retain in the blood solutes greater than 50,000 Daltons.

41. A method as in claim 39 wherein the hollow fibers have blood passages of approximately 0.2 mm or less in diameter.

42. A method as in claim 38 wherein the filter has a trans-membrane pressure (TMP) in a range of 150 millimeters (mm) of mercury (Hg) to 250 mmHg.

43. A method as in claim 27 wherein the blood flow through the filter causes a shear rate of the blood between 1,000 sec^{-1} per seconds and 2,500 per seconds.

44. A method as in claim 27 wherein the filtration is ultrafiltration.

45. A method as in claim 27 further comprising minimizing extraction of solutes during filtration.

46. A method as in claim 27 wherein blood flows continuously through the filter during periods in which a blood pump is pumping the removed blood.

47. A method as in claim 27 wherein excess water removed from the blood flows intermittently from the filter.

48. A method as in claim 47 wherein a valve in a flow path from the filter for removal of excess water cyclically stops and starts the flow of excess water from the filter.

49. A fluid removal apparatus comprising:

a blood removal catheter for insertion into a peripheral vein or artery and having a size 16 standard gage needle or less;

a filter having a blood inlet port coupled to the blood removal catheter, a blood outlet port, an excess fluid removal port, and a blood flow passage with porous membrane which passes fluids to the fluid removal port and retains solutes of 50,000 Daltons or greater, and

a blood return catheter for inserting into a peripheral vein or artery and having a size of 16 standard gage needle or less.

50. An apparatus as in claim 49 further comprising a blood pump coupled to pump blood into the filter.

51. An apparatus as in claim 49 further comprising a valve coupled to the excess fluid removal port of the filter, and the valve cyclically switched to turn on and off flow of the excess fluid from the filter.

52. An apparatus as in claim 49 wherein the filter includes capillary, hollow fibers.

53. An apparatus as in claim 49 wherein the hollow fibers have filtering pores which retain in the blood solutes greater than 50,000 Daltons.

54. An apparatus as in claim 49 wherein the hollow fibers have blood passages of approximately 0.2 mm or less in diameter.